Neurocognitive and Personality Factors in Homo- and Heterosexual Pedophiles and Controls

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ABSTRACT

Introduction. Several neuropsychological studies have suggested an association between pedophilia, neurocognitive disturbances, and specific personality profiles. However, inconsistencies in the findings have not been explained sufficiently, because many studies did not control for possible confounding factors, such as age, education level, or gender orientation.

Aim. Therefore, the present investigation examined neurocognitive performance and personality profiles in pedophiles in dependence of sexual gender preferences and sexual deviance, as well as with regard to age and education level.

Main Outcome Measures. Scores on the different neurocognitive tests, personality questionnaires, and Structured Clinical Interview for the Diagnostic and Statistical Manual of Mental Disorders (DSM)-IV (SCID) interviews.

Methods. An extensive neurocognitive test battery (including a reduced version of the German Wechsler Adult Intelligence Scale, the Wisconsin card-sorting test, d2 Attention-Deficit Test, and the Corsi block-tapping test) as well as two personality questionnaires (Minnesota Multiphasic Personality Inventory [MMPI-2] and the Multiphasic Sex Inventory [MSI]) were used to examine a consecutive sample of 20 psychiatrically assessed (SCID I and II) pedophile inpatients (nine exclusively attracted to females and 11 to males) from two high security forensic hospitals and 28 healthy controls (14 heterosexual, 14 homosexual).

Results. Compared with controls, pedophiles showed neurocognitive impairments and personality specifics in the majority of tests and questionnaires, such as reduced values on the intelligence scale and weaker performances in information processing, together with high scores for psychopathy and paranoia, and signs of sexual obsessiveness and sexual dysfunction. In contrast to previous reports, some of these alterations were at least partly explained by factors other than pedophilia, such as education level or age.

Conclusion. These alterations may be seen to be in line with the hypothesis of a perturbation of neurodevelopment in early life. These results enhance our knowledge about pedophilia-associated impairment in neurocognitive functioning and personality structure insofar as they allow a more detailed description of, and insight into, modulatory factors. Kruger THC and Schiffer B. Neurocognitive and personality factors in homo- and heterosexual pedophiles and controls. J Sex Med 2011;8:1650–1659.

Key Words. Sexual Deviance; Pedophilia; Sexual Gender Orientation; Sexual Offender; Neurocognitive Impairment; Personality Profiles

Introduction

Pedophilia is a psychiatric disorder of great public concern characterized by intense sexually arousing urges and behaviors focused on sexual activity with a prepubescent child. According to estimates by the German authorities (Bundeskriminalamt), the incidence of child sexual abuse (which surely does not equate with pedophilia per se) in Germany is as high as 550 cases per day (200,000 per year), though only every twentieth case is recorded. In the United
Variations in sexual preferences in men may have multiple causes: genetically initiated events; experience-induced learning; brain structure; and certain features of an ancestral environment [2]. Despite various investigations, evidence of a causal relationship between abnormal brain functioning and pedophilia has remained elusive, as have associations with specific personality profiles. Numerous studies have discussed associations between behavioral desinhibition, frontal abnormalities, and impaired cognitive executive functioning. Although recent data from neuropsychological, personality, sexual history, plethysmography, and neuroimaging investigations suggest that pedophilia is linked to early neurodevelopment perturbations [3,4] the (neo-) psychological basis of the disorder is still unidentified, and a coherent neuropsychiatric model, which is also qualified to generate a clear hypothesis about the neuropsychological performance of sexual deviant groups, is still missing [5].

The major aim of this study was to carry on the investigation of (neo-) psychological and personality processes in aberrant sexual preferences. Besides the low number of published studies on specific paraphilias so far, at least two points have to be reconsidered when looking at the literature: (i) the lack of experimental and statistical control of potentially confounding variables; and (ii) the huge heterogeneity of subjects within the different sexual deviant subgroups, which has not been adequately addressed. Possibly, some of the inconsistent findings on personality structure and neurocognitive performance can be explained by these limitations. The categorization of the examined population by delict groups, such as rape or exhibitionism, and not by psychiatric disorder may have been one important limiting factor. When a specific disorder was named, such as pedophilia, this was often considered the same as sexual abuse in general. However, within the group of abusers—which shows very distinct motive forces and personality structures—only 10% were pedophiles in terms of a stable sexual deviation as required by the Diagnostic and Statistical Manual of Mental Disorders (DSM)-IV criteria [6]. Furthermore, the sexual gender orientation was often disregarded, even though it has previously been shown that the fixation on male children occurs more often in pedophilic than in nonpedophilic abusers. Generally, girls are sexually abused three times more often than boys [7], but pedophilic abusers victimize boys more often than girls. Finally, it has been shown that homosexual pedophilia is more difficult to treat and that these subjects suffered relapses more frequently than pedophiles who are only attracted to female children [8].

Taking these limitations into account the current investigation aimed to systematically assess the neurocognitive performance and personality profiles of four groups with different sexual gender orientation (hetero- vs. homosexual) and age preference (age adequate vs. pedophile), however, with huge homogeneity in many other aspects. We have controlled our data for the influences of potentially confounding variables, such as age or education level, and examined whether the neurocognitive performance and personality structure varied between groups in dependence on either sexual deviance or gender orientation.

Method

Subjects

From a population of 200 sex offenders in two high-security forensic treatment facilities, we screened 60 child molesters for participation in this study. We only included those who met the DSM-IV criteria of pedophilia [6], were exclusively attracted to male or female children, were not limited to incest and were not medicated. Typologically, only child molesters from the interpersonal type with a high deviant fixation level were included [9]. Of the 23 pedophile patients who met these criteria, 20 (nine exclusively attracted to girls and 11 to boys) with a mean age of 37.7 years (±7.9 standard deviation [SD], range 22–54) were prepared to take part in the examination. Three subjects refused participation; one because of neurological impairments.

Twenty-four healthy volunteers (14 homosexual and 14 heterosexual males) with a mean age of 33.6 years (±7.2 SD, range 22–46) were recruited to match the patient group for age, sexual orientation, handedness, socioeconomic stratum, and education level (Table 1). Sexual orientation was self-assessed by controls using the Kinsey Scale [10]. Only those subjects who scored 0 or 1 (exclusively or predominantly heterosexual), or 5 or 6 (exclusively or predominantly homosexual) were included. Subjects with a history of neurological or systemic illness, head injury, any form of current addictive behavior except nicotine use, or a personal or family history of major psychiatric illness, such as psychotic or bipolar disorders, were excluded. Permission to conduct the study was obtained from the Ethics
Committee of the Faculty of Medicine, University of Duisburg-Essen, Germany. Written informed consent was obtained from all participants.

Diagnostic Assessment

All diagnoses that are depicted in Table 2 are based on the DSM-IV criteria and were confirmed using the Structured Clinical Interview for Axis I DSM-IV Disorders (SCID I) and the SCID Axis II Personality Disorders (SCID II) [11]. Two subjects refused clinical assessment by SCID.

For crime assessment, we analyzed the court reports. Only those patients with a history of repeated sexual abuse of children were included in the study. The WIP (a reduced version of the German Wechsler Adult Intelligence Scale [WAIS]) was utilized to assess different intelligence levels [12]. Further, the Wisconsin card-sorting test (WCST-64) [13] was used to estimate executive functioning (e.g., cognitive flexibility [set shifting] and abstract reasoning), the d2 Attention-Deficit Test [14], and the Corsi block-tapping test for estimating alertness [15], and visuospatial or working memory capacity.

All subjects underwent testing for basic measures of personality and psychosexual aspects using the Minnesota Multiphasic Personality Inventory, Version 2 (MMPI-2) [16], and the Multiphasic Sexuality Inventory (MSI) [17]. Demographic and psychosocial measures (Table 1) were derived from our own questionnaire, including age, height, weight, family status, education level, life events, daily hassles, and contentedness in different life areas.

Statistics

To examine differences between participants with different sexual preferences and gender orientation, we conducted two sample T-tests separately for the neurocognitive and personality parameters as well as the sociodemographical data. Further analyses of covariance (ANCOVA) were conducted to eliminate the influence of potentially confounding factors, such as age or education level. Additionally, the influence of sexual gender orientation on differences in the test performance of pedophile
and nonpedophile subjects was examined by conducting a two-factor multivariate analysis of variance (MANOVA; age preferences × sexual gender orientation) with the gender orientation as an additional within subjects’ factor. For all analyses the Statistical Package for the Social Sciences (SPSS, 10.0 for Windows, SPSS Inc., Chicago, IL, USA) was used.

Results

Psychiatric Comorbidity

SCID II and II

The axes I and II comorbidity in the pedophile sample is described in Table 2. It shows that, apart from pedophilia, 12 of the 18 inpatients (66.6%) also fulfilled the lifetime criteria of at least one further axis I disorder. The highest prevalences were found for anxiety and mood disorders. The comorbidity rate for personality disorders (axis II) was similarly high (61.1%), whereas many patients simultaneously fulfilled the criteria of more than one personality disorder. The most common axis I disorder was social phobia. A lifetime diagnosis of post-traumatic stress disorder (PTSD) was found in five of the 18 patients, although even more patients had experienced traumatic events, particularly sexual abuse, in their history. Three of the five patients with lifetime criteria of PTSD depicted symptoms of this disorder up to the time of assessment. The most common personality disorders descended from the B cluster, such as borderline personality disorder, and the C cluster, such as avoidant personality disorder, with the criteria being fulfilled in every third patient.

Neurocognitive Performance

WIP

As shown in Table 3, the performance of pedophiles and controls significantly differed in all subtests except the subtest completing images. However, the sexual gender orientation had no influence on this, but for general knowledge a significant interaction effect with sexual deviance and gender orientation was documented. Within the pedophile group, the performance of the heterosexuals was weaker, whereas in the control group that of the homosexuals.

To examine whether pedophiles showed neurocognitive differences independent of education level, we entered the variable “years of education” as covariate into an ANCOVA model. Except for the mosaic test, all differences described earlier lost statistical significance (General knowledge: $F_{1, 46} = 0.0; P < 0.99$; Communality finding: $F_{1, 46} = 0.0; P < 0.83$; Completing images: $F_{1, 46} = 0.1; P < 0.75$; Mosaic test: $F_{1, 46} = 1.8; P < 0.19$; Total score: $F_{1, 46} = 0.1; P < 0.77$).

d2 Attention-Deficit Test

The d2 test assesses several parameters connected with information processing. Pedophiles displayed significantly weaker performances in all subtests except the total numbers of errors (Table 3). However, sexual gender orientation had no significant influence on these findings, although age of the participants, which was slightly but not significantly higher in the patient group, modulated these findings as indicated by the corresponding ANCOVA model. All differences lost significance when the influence of age was partialized out of the group model (fluctuation margin: $F = 2.27$, $P = 0.14$; performance: $F = 2.38$, $P = 0.13$; total score: $F = 1.72$, $P = 0.20$).

Corsi block-tapping test

As shown in Table 3, visuospatial memory capacity varied in dependence on sexual deviance only for the Supra Block span II. Age may have had some influence on this finding; however, significant differences remained when age was entered into an ANCOVA model. In contrast, gender orientation had no modulatory influence on the documented group differences.

WCST

Abstract reasoning and cognitive flexibility as measured by the WCST revealed differences between the groups for the total number of errors and the nonpersevering errors (Table 3). Additionally, a significant interaction effect with sexual deviance and gender orientation was observed for the number of nonpersevering errors. In the ANCOVA model it was shown that the group difference for the nonpersevering errors was also more strongly modulated by the age of the participants than by their sexual preferences with only borderline significance ($F_{1, 46} = 3.1; P < 0.08$). Sexual gender orientation did not modulate the performance in this test.

Personality Measures

MMPI-2

The extensive MMPI-2 results are presented in Figure 1. The validity scales differed between groups, but they were interpretable for all, even though the infrequency scale partially achieved enhanced t-scores. Pedophiles showed high
<table>
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<tr>
<td></td>
<td>Hetero (N = 9)</td>
<td>Homo (N = 11)</td>
<td>Hetero (N = 14)</td>
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<td>Statistic</td>
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<td>MANOVA</td>
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<td>F = 0.079</td>
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<td>14) Homo (N = 14)</td>
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<td>1.086</td>
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<td>14) Deviance</td>
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<td>5.521**</td>
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<td>Statistic</td>
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<td>0.003</td>
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<tr>
<td>Attention deficit test</td>
<td>29.1 ± 22.1</td>
<td>20.1 ± 13.5</td>
<td>T = 1.1</td>
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<tr>
<td>Fluctuation margin</td>
<td>15.2 ± 6.2</td>
<td>12.4 ± 3.9</td>
<td>T = 1.2</td>
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<tr>
<td>Performance</td>
<td>98.7 ± 8.3</td>
<td>99.6 ± 11.2</td>
<td>T = -0.2</td>
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<tr>
<td>Total score</td>
<td>98.3 ± 8.1</td>
<td>100.6 ± 11.8</td>
<td>T = -0.5</td>
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<td>Reduced Wechsler Adult Intelligence Scale (WIP)</td>
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<tr>
<td>General knowledge</td>
<td>41.4 ± 9.1</td>
<td>46.2 ± 7.8</td>
<td>T = -1.3</td>
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<tr>
<td>Commonality finding</td>
<td>48.6 ± 8.1</td>
<td>52.1 ± 6.3</td>
<td>T = -1.1</td>
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<tr>
<td>Completing images</td>
<td>54.2 ± 6.6</td>
<td>53.0 ± 6.7</td>
<td>T = 0.4</td>
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<tr>
<td>Mosaic test</td>
<td>54.2 ± 8.0</td>
<td>54.1 ± 10.4</td>
<td>T = 0.3</td>
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<tr>
<td>Total score (IQ)</td>
<td>49.1 ± 7.9</td>
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<td>T = -0.7</td>
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<td>Corsi block-tapping test</td>
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<tr>
<td>Visuospatial memory</td>
<td>5.1 ± 0.8</td>
<td>4.8 ± 0.8</td>
<td>T = -0.8</td>
</tr>
<tr>
<td>Supra Block span I</td>
<td>3.0 ± 1.6</td>
<td>3.2 ± 2.4</td>
<td>T = -0.2</td>
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<td>Supra Block span II</td>
<td>2.9 ± 3.1</td>
<td>2.6 ± 2.7</td>
<td>T = 0.2</td>
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<tr>
<td>Wisconsin card-sorting test-64 (WCST)</td>
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<tr>
<td>Total numbers of errors</td>
<td>44.4 ± 6.3</td>
<td>49.0 ± 6.3</td>
<td>T = -1.6</td>
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<tr>
<td>Persevering response</td>
<td>46.8 ± 6.2</td>
<td>46.0 ± 6.7</td>
<td>T = 0.3</td>
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<tr>
<td>Persevering errors</td>
<td>46.8 ± 5.2</td>
<td>47.2 ± 6.5</td>
<td>T = -0.2</td>
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<tr>
<td>Nonpersevering errors</td>
<td>44.0 ± 7.3</td>
<td>49.3 ± 4.5</td>
<td>T = -2.0</td>
</tr>
<tr>
<td>Coherent responses</td>
<td>44.8 ± 5.6</td>
<td>49.0 ± 6.7</td>
<td>T = -1.5</td>
</tr>
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**P < 0.01; *P < 0.05.
MANOVA = multivariate analysis of variance.
scores for two MMPI basic scales (psychopathy and paranoia) and enhanced t-scores, except of hypomania, for all other basic scales. Control subjects showed enhanced t-scores only for the masculinity/femininity scale.

Potentially confounding variables, such as age and education level, had no significant influence on these findings (data not shown). However, the two-factor MANOVA revealed significant interaction effects between sexual age preferences and gender orientation for hypochondriasis ($F_1, 46 = 4.2; P < 0.05$), hysteria ($F_1, 46 = 5.7; P < 0.02$), and hypomania ($F_1, 46 = 13.9; P < 0.01$). On the hypochondriasis and hysteria scales, the pedophilic sample basically showed higher scores than the control sample. However, the heterosexual pedophiles had higher scores than the homosexual pedophiles, whereas in the control sample the homosexual controls had the highest scores. For hypomania that relation was reversed. Potentially interesting subscale results, which are not shown in total in this section, are picked up in the discussion section.

**Discussion**

Although recent data on neuropsychological, personality, sexual history, plethysmography, and neuroimaging investigations suggest that pedophilia is linked to early neurodevelopment perturbations [3,4], the neurobiological and neuropsychological basis of the disorder is still unidentified. In this study we simultaneously examined the neurocognitive performance and personality profiles (including psychiatric comorbidity) of male pedophilic forensic inpatients and healthy controls with regard to sexual gender orientation and possible confounding factors such as age and education level.

**Psychiatric Comorbidity**

Lifetime prevalences of axis I and current prevalences of axis II disorders in pedophiles were largely comparable with previous reports [18–20]. Mood and anxiety disorders were the most common disorders in the current population. Most

Figure 1 Minnesotta Multiphasic Personality Inventory–2 (MPPI) Basic Scale t-scores for homo- and heterosexual pedophiles and controls. **$P < 0.01$; *$P < 0.05$ for the pedophiles vs. controls comparisons, no significant differences caused by the sexual gender orientation could be observed.
frequently, pedophiles fulfilled the lifetime criteria for major depressive episodes, social phobia, and alcohol abuse, but not alcoholism. Only six subjects had no other psychiatric diagnosis besides pedophilia. On the other hand, 38.8% of the pedophiles also fulfilled the criteria for at least one cluster C personality disorder. Following obsessive compulsive disorders, the highest comorbidity rate was achieved for avoidant personality disorder (33%). The axis II comorbidity in obsessive compulsive disorders is valued at 50% (e.g., [21,22]) with a comparable affinity with the cluster C disorders. In contrast to cluster A disorders, which were relatively infrequent (16%), the cluster B disorders were found quite often (33%). The presence of these disorders may make it difficult for patients to respond effectively to the rigors of sex offender treatment, which often uses confrontational group therapy and cognitive behavioral therapy approaches [20]. These data support the view that attention to the diagnosis and treatment of comorbid psychiatric disorders is essential for the understanding and treatment of this population.

Neurocognitive Performance

The WIP showed significant group differences in three of the four subtests as well as in global intelligence levels, as indicated by the total score. Only the subtest “completing images” resulted in no differences between pedophiles and controls. The magnitude of the differences was about one standard deviation for all subtest results. Interestingly, the greatest difference was observed for the mosaic test, which has the most important implications for neurodevelopmental cognitive impairment.

Although the results may not be specific to pedophilia, because of the differences in education levels, intellectual disabilities may be an expression of a neurodevelopmental disorder, because not only is the examined sample representative of the pedophilic forensic inpatient group, but these findings are also in line with previous findings [3,4,23]. However, except for the study of Cohen, previous studies have failed to statistically control for education level [4]. For this reason, our results seem to be more than an epiphenomenon and cannot be explained solely by different education levels or be declared as sample-specific. Whether the documented discrete neurocognitive impairments of pedophile inpatients are an expression of a neurodevelopmental disorder, as hypothesized before [3], will have to be examined by future studies using, for example, a combination of neurocognitive tasks and functional imaging techniques. The most recent study, which documents similar differences on the subscales of the WAIS between nonexclusive pedophilic subjects and several control groups, did not account for education level [3]. Regarding the study by Cohen and coworkers who did not observe significant differences when education level was controlled [4], there is concordance with the findings presented here which points to the importance of controlling for such factors.

The d2 Attention-Deficit Test also revealed discrete differences related to pedophilic age preferences. The absolute values were located in the normal range, but the control subjects’ performance was on average 20% better. Certainly, neither information processing velocity (total score), nor performance permanence over time (fluctuation margin) showed significant group differences, if age as the confounding factor was counted out of the group model in the ANCOVA. Nevertheless, neurocognitive impairments,
including information velocity, information capacity, and vigilance, were still significantly diminished after controlling for age.

The visuospatial memory capacity of the short-term memory as indicated by the Corsi block-tapping test was within normal range, even though the control group performed on average one point better than the pedophile group. This finding is in line with studies that revealed deficits in the verbal short-term memory (e.g., [3]). Certainly, 44% of the average sample achieved a direct block span of 5 and 41% of 6. Only 15% achieved better results and 15% weaker ones. It is known that age is correlated with \( r = 0.25 \) to the test performance [15]. Thus, the influence of age was expected. However, the group differences remained significant when age was counted out of the group model. The supra block span showed no significant differences between groups, indicating that pedophiles have no right hemispheric hippocampal dysfunction.

The WCST-64 showed significant differences between controls and pedophiles for total errors and the number of perseverative errors. All other values, particularly the perseverative errors and responses, indicating problems with cognitive flexibility as an executive function, showed no significant differences between groups. The differences in the total errors and the perseverative errors were confounded by the age variable. So, the reported differences do not indicate problems with the normative executive control (located in the dorsolateral prefrontal cortex [DLPFC]) in the pedophile sample. These results contrast with the opinion of several research groups, who postulate that sexual offences in general are directly associated with a lack of executive functioning, decision-making abilities, or the disability to control sexual impulses (e.g., [24]). Also recent functional imaging studies from our as well as other laboratories have pointed towards alterations in the DLPFC function in pedophiles during the processing of visual sexual stimuli [25–27]. Therefore it is possible that the WCST-64 was not able to detect such alterations in the current sample because of sample size or limited sensitivity. Where other studies incorporated larger sample sizes, there was a higher degree of heterogeneity compared with the present study. Thus, this issue deserves further validation in studies combining neurocognitive performance with functional imaging.

Altogether the current neurocognitive test battery did not indicate a pedophilia-specific pattern of cognitive dysfunction. The often reported lower intelligence level certainly did not explain the phenomenon on a causal level, because on average 23% of healthy subjects achieve an IQ of less than 89 points. However, besides pedophilia, a diminished intelligence level may also be regarded as a clinical epiphenomenon caused by an underlying neurodevelopmental disorder as discussed earlier. We think that this theory warrants further investigation using homogeneous samples of pedophiles as in the present study.

**Personality**

As a sample of inpatients was selected, a relatively conspicuous personality profile in pedophiles was expected. However, the high scores on the paranoia, schizophrenia and psychopathy scales were striking. The values for paranoia and schizophrenia are in line with results of others [28]. However, it remains residual as to whether the patients were indeed schizotypical in sense of the scale or whether the finding may be explained by factors such as the long stay in a forensic hospital. It is known that long periods in a forensic hospital often lead to increased interpersonal sensitivity and a habitual tendency to misinterpret the motives and intentions of others. The high score on the psychopathy and other scales may certainly be explained by the anomalously honest answering, which is documented by the validity scales and the clinical impression. The values on the correction scale that is used as a validity scale were lower in pedophiles than in controls \((F = 6.46; P < 0.015)\) indicating inadequate defense mechanisms and an extremely negative self-concept in pedophiles. This is in line with several low subscale values, such as social introversion, anxiety, submissiveness, shyness, depression, suicidality and sadness, and with a high prevalence of psychiatric comorbidity, such as mood disorders, social phobia, and avoidant personality disorder, in the current sample that corroborates with various reports in the literature [20,29,30]. The assumption that pedophiles are anxious and depressive is often found in the literature and is supported by the current data. In contrast to the controls, the pedophiles achieved significantly higher scores on the scales for social introversion, anxiety, conformation and diffidence, as well as on those for depression, suicidality, loss of interest, and sadness, and are clearly notwithstanding average sample values. The personality profile of pedophiles on the subscales for social discomfort, conformation, unsociability, social dominance, social responsibility, and male gender role uphold the empirically less
sustained hypothesis that pedophiles often show social inadequateness, act passively in social relationships, isolate themselves, or bring themselves in social dependencies [31]. The common hypothesis that pedophiles do not act violently and are less aggressive in general was not sustained by the self-depiction on the corresponding MMPI-2 scales in this study. In contrast to controls, pedophiles neither displayed overcontrol of aggressive impulses nor pronounced inhibition of aggression; furthermore, the scale for aggressive behavior was not significantly reduced in pedophiles.

**Psychosexual Aspects**

Compared with the small German normative sample of the MSI, the pedophilic inpatients in the current study achieved striking values in several scales, such as the sexual obsessiveness scale. The exceptionally high value corresponds to a percent rank of 80 and indicates the high sexual fixation of the pedophile subjects recruited for this study. Interestingly, the amount of cognitive distortions and immaturity was slightly increased in both groups—the pedophile and the control group—which for the latter group was foremost a consequence of the homosexuals’ contribution.

**Conclusions**

In summary, our findings support and extend previous reports on neurocognitive and personality parameters in pedophilia, and provide a more detailed and better controlled analysis and description of diverse modulatory influences. A great part of the findings correlated with education level, which in contrast to earlier studies was statistically controlled in this study. Nevertheless, it remains unclear whether the discrete weaker neurocognitive performances of pedophiles were sample-specific or an expression of the hypothesized neurodevelopmental disorder and, insofar, part of the pedophilic disorder. Future neurocognitive investigations should include both brain imaging techniques and neuropsychological assessments, promising further insight into the (neuro-) psychological mechanisms of deviant sexual arousal patterns, and the neurodevelopmental disorder hypothesis.

**Acknowledgments**

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